

**EOSDIS Backbone Network  
(EBnet)  
Traffic Requirements**

**23 January 1997**

**EBnet Project  
NASA Communications Division  
Code 540  
Goddard Space Flight Center**

## **Identification of Traffic Requirement Listings Provided**

### **Baseline 5 - Current EDOS RESHAPE (Adaptive Downlink)**

The EBnet Traffic Requirements Database was placed under Nascom configuration control on 8 May 1996. The database contents as of 8 May were referred to by Nascom Traffic Requirement (NTR) CCR #1. Fourteen additional NTR CCRs have been implemented since then:

CCR #15 - EBnet Protocol Overhead Factor Modification. This CCR changed the existing EBnet Protocol Overhead Factor from 1.33 to 1.25. This modification has been made to provide a consistent application of overhead factors among all EBnet customers. *CCR implemented on 1/22/97.*

CCR #14 - The Addition of ADEOS II Requirements. This CCR added new requirements for the ADEOS II project. Data flows involve housekeeping, AMSR, SeaWinds, Mission Files, DCS, ILAS-II, and GLI traffic. Mutually exclusive requirements have been noted for traffic between ASF/WFF and NASDA (via JPL). A new overhead factor has been added to identify EDOS contingency without data peaking (1.20 vs. the standard 1.5). The spacecraft's launch date has also been updated. *CCR implemented on 1/21/97.*

CCR #13 - Addition of Sage III/METEOR Requirements. This CCR added new traffic requirements between LaRC and WFF. It should be noted that two out of the three requirements contain insignificant data rates (i.e., 0 Kbps for all practical purposes). The spacecraft's launch date has been updated. *CCR Implemented on 1/21/97.*

CCR #12 - Addition of ASF-CSA Requirements for RADARSAT. This CCR added new requirements for RADARSAT from ASF to the Canadian Space Agency. *CCR implemented on 1/21/97.*

CCR #11 - Addition of AM-1 ASTER Requirements. This CCR added new ASTER traffic requirements to/from ASTER GDS, GSFC and JPL. These requirements included Expedited Data Sets (EDS), Housekeeping (real-time and rate buffered), Human Computer Interface (HCI), Instrument Support Toolkit (IST), and others (e.g., EOC Database transfer and command groups). The EBnet overhead factor used for these requirements (except for IST) was a total of 2.34 (Circuit Utilization = 1.25, EDOS and IP Protocol = 1.25, and EDOS Contingency for IP Traffic = 1.5). ASTER IST traffic used a scheduling factor of 2.5. ASTER requirements using physical media were also deleted from the database. *CCR implemented on 1/7/97.*

CCR #10 - Updates from ECS-TRMM IRD DCN-06. This CCR modified terminology in the Comments field as well as the deletion of two records to reflect the changes made in the ECS-TRMM IRD (CCR 505-41-14-006-A, dated

8/96). Note that some Ancillary Data flows remain undefined. *CCR implemented on 1/7/97.*

CCR #9 - ASF Activation Date 12/1/98. This reflect a slip in ASF DAAC activation from 5/1/97 to 12/1/98. Only User Query/Query Response flows were affected by this modification. *CCR implemented on 1/7/97.*

CCR #8 - Relabelling of Appendix D, Level 0 & Expedited Traffic. Volume 0, Appendix D Level 0 and Expedited instrument traffic were prefaced with "Level 0:\_" for sort order in the database listing. This action was not content related. *CCR implemented on 1/7/97.*

CCR #7 - Removal of Landsat-7 Image Assessment System (IAS) flows. These intra-EDC flows will not be supported by EBnet. Comments for this CCR were received at the July 1996 Traffic Review. *CCR implemented on 10/22/96.*

CCR #6 - Addition of SDPF-TRMM Consumer ICD. This CCR added Quick Look, Level 0, and Ephemeris traffic to the database. These requirements replaced older estimates from the TRMM DMR. It should be noted that the quicklook delivery time remains unresolved; 90 minutes assumed domestically; 105 minutes assumed for Japan. *CCR implemented on 8/30/96.*

CCR #5 - Addition of Reed-Solomon Overhead Factor: This CCR added an overhead factor of 1.16 to account for the Reed Solomon encoding of the clock and data streams that will be stored/forwarded from the GSIFs to the LZPF. This is to account for the deletion of the Reed-Solomon overhead in the latest update of Appendix D. *CCR implemented on 8/8/96.*

CCR #4 - Update to EDOS Overhead Factors: Changes affect level 0, expedited, and rate buffered traffic. A multiplier of 1.25 was adopted for protocol and a multiplier of 1.50 was adopted for contingency. Multipliers for AM-1 expedited traffic were adopted based on AM-1 instrument rates and LZPF processing rates and resulting time to deliver. A generic multiplier was assumed for expedited traffic for all missions beyond AM-1. *CCR Implemented on 6/19/96.*

CCR #3 - ESDIS Level 2 Requirements, Volume 0, Appendix D Cleanup (ESDIS CCR 505-01-30-009): This change modifies store and forward flows for missions beyond AM-1 and corrects errors in PM-1 and PM-2 requirements. Minor data rate corrections were also made for AM-1. *CCR was implemented on 6/18/96.*

CCR #2 - AHWGP Reprocessing Traffic: This change increases inter-DAAC science traffic in 1999 and beyond; only minor changes occur prior to 1999. *CCR was implemented on 6/12/96.*

## **Pending Changes**

- 1) ECS Replan will change traffic volumes and requirement start and end dates.
- 2) Traffic requirements for AM-1 Contingency Backup Ground Stations in Alaska and Norway may be added if they are assigned to EBnet.
- 3) TRMM science data requirements may be updated to reflect the changes in traffic volumes and the use of the new TRMM Science System (TSS).
- 4) SMC and network management flows will be added to the database when they are defined.
- 5) Management flows between EDOS elements may be refined.

## **Mission Timeframes:**

The timeframes during which missions are active (and their requirements must be satisfied) are maintained in the database. This enables appropriate subsets of requirements to be selected when summarizing bandwidth requirements for a given date. Mission life is assumed to be six years for EOS missions and three years for TRMM. In some cases, the date '1/1/2020' is used to indicate that no end date has been identified. The following table illustrates the current mission profiles in the database.

Mission	Phase	Start Date	End Date
ADEOS-I	On-Orbit Operations	8/1/96	1/1/2005 ?
ADEOS-II	On-Orbit Operations	1/1/99	1/1/2020 ?
AM-1	Pre-Launch	8/1/96	6/30/98
AM-1	On-Orbit Operations	6/30/98	7/1/2004
AM-2	On-Orbit Operations	6/1/2003	6/1/2009
CHEM-1	On-Orbit Operations	6/1/2002	6/1/2008
Institutional Services	All	8/1/96	1/1/2020
LALT-1	On-Orbit Operations	1/1/2003	1/1/2009
Landsat-7	On-Orbit Operations	5/1/97	1/1/2020
METEOR	On-Orbit Operations	5/1/97	1/1/2003
METEOR	WFF Ground Station Support	8/1/98	1/1/2003
Not Specified	Not Specified	8/1/96	1/1/2020
PM-1	On-Orbit Operations	12/1/2000	12/1/2006
PM-2	On-Orbit Operations	1/1/2006	1/1/2012
RADARSAT	On-Orbit Operations	4/11/95	4/11/2000
TRMM	Pre-Launch	1/1/96	11/19/97
TRMM	Launch-Early Orbit	11/19/97	11/19/97
TRMM	On-Orbit Operations	11/19/97	11/19/2000
TRMM	Science Operations	8/1/96	11/19/2020

Also with regards to timeframes, note that the earliest date when the EOSDIS ground stations in Alaska and Norway are activated for testing is assumed to be June 2000.\_\_\_\_

## Information Sources

The following pages contain a listing of requirement information sources included in the traffic database.

**Baseline Data Sources**

**Baseline: 5**

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<b>Mission</b>	<b>Information Source</b>	<b>CCR #</b>	<b>CCR Title</b>
ADEOS-I	ADEOS MRR Update Memo - 10/13/95	1	EBnet AM-1 Review Baseline
ADEOS-II	ADEOS II Trans-Pacific Network Flows spreadsheet 12/96	14	Add ADEOS II Requirements
AM-1	AHWGP Reprocessing Spreadsheet; 6/96	2	AHWGP Reprocessing
AM-1	AHWGP Spreadsheet; 3/96	1	EBnet AM-1 Review Baseline
AM-1	ASTER GDS Interface Meeting 10/96	11	New ASTER traffic requirements
AM-1	ICD: EBnet-EOC; 2/96; 540-031	1	EBnet AM-1 Review Baseline
AM-1	ICD: EBnet-GSE; 3/96; 540-093	1	EBnet AM-1 Review Baseline
AM-1	ICD: EBnet-SCS; 3/96; 540-091	1	EBnet AM-1 Review Baseline
AM-1	ICD: EBnet-SDF; 3/96; 540-096	1	EBnet AM-1 Review Baseline
AM-1	ICD: EBnet-SSIM; 3/96; 540-092	1	EBnet AM-1 Review Baseline
AM-1	Volume 0 Appendix D	1	EBnet AM-1 Review Baseline
AM-1	Volume 0 Appendix D	3	RESHAPE CCR Cleanup
AM-2	Volume 0 Appendix D	1	EBnet AM-1 Review Baseline
AM-2	Volume 0 Appendix D	3	RESHAPE CCR Cleanup
CHEM-1	Volume 0 Appendix D	1	EBnet AM-1 Review Baseline
CHEM-1	Volume 0 Appendix D	3	RESHAPE CCR Cleanup
Institutional Services	ICD: EBnet-EOC; 2/96; 540-031	1	EBnet AM-1 Review Baseline
Institutional Services	Table 4 - CH26 - 9/20/95	1	EBnet AM-1 Review Baseline
LALT-1	Volume 0 Appendix D	1	EBnet AM-1 Review Baseline
LALT-1	Volume 0 Appendix D	3	RESHAPE CCR Cleanup
Landsat-7	EOSDIS-Landsat-7 IRD - 7/95	1	EBnet AM-1 Review Baseline
METEOR	Mission Network Plans v1.0 11/26/96	13	Add Sage III/METEOR Requirements (WFF-LaRC)
METEOR	AHWGP Reprocessing Spreadsheet; 6/96	2	AHWGP Reprocessing
METEOR	AHWGP Spreadsheet; 3/96	1	EBnet AM-1 Review Baseline
Not Specified	DID-220 UQ/QR/ADS Tables - 10/95	1	EBnet AM-1 Review Baseline
Not Specified	DID-220 UQ/QR/ADS Tables - 10/95	9	ASF DAAC Activation Date 12/1/98
Not Specified	ICD: ECS-NOAA ADC; 12/95; 209-CD-006-004	1	EBnet AM-1 Review Baseline
PM-1	Volume 0 Appendix D	1	EBnet AM-1 Review Baseline
PM-1	Volume 0 Appendix D	3	RESHAPE CCR Cleanup
PM-2	Volume 0 Appendix D	1	EBnet AM-1 Review Baseline
PM-2	Volume 0 Appendix D	3	RESHAPE CCR Cleanup

<b>Mission</b>	<b>Information Source</b>	<b>CCR #</b>	<b>CCR Title</b>
RADARSAT	ASF/CSA Network Interface Email 7/22/96	12	ASF-CSA Requirements for RADARSAT
TRMM	AHWGP Reprocessing Spreadsheet; 6/96	2	AHWGP Reprocessing
TRMM	AHWGP Spreadsheet; 3/96	1	EBnet AM-1 Review Baseline
TRMM	ICD: EBnet-TSDIS; 2/96; 540-047	1	EBnet AM-1 Review Baseline
TRMM	LIS SCF Data Flows; 4/1/96	1	EBnet AM-1 Review Baseline
TRMM	SDPF-TRMM Consumer ICD	6	Add SDPF-TRMM Consumer ICD
TRMM	TRMM DMR - 6/94	1	EBnet AM-1 Review Baseline
TRMM	TRMM-EOSDIS IRD	1	EBnet AM-1 Review Baseline
TRMM	TRMM-EOSDIS IRD	10	New TRMM DCN-06 Updates

## **Understanding the Traffic Requirements Listings**

### **Data Type / Instrument:**

The information under this heading provides a categorization of the requirements. This will typically be 'commands', 'housekeeping', or a specific instrument name. Descriptions found in the requirement information source are used whenever possible.

### **Data Rates:**

Average, peak, and design data rates are provided in units of kilobits per second. Average and peak rates are taken from the information source and act as a raw (unburdened) rate. The design data rate is obtained by applying design factors to either the average or peak rate.

### **Source and Destination:**

Source and destination contain a description of the true end points of the data flow as described in the information source.

### **Source and Destination Nodes:**

Source and destination nodes are assigned by Nascom based on the source and destination specified in the information source. For example, if the source were 'EOC', then the source node would be 'GSFC'.

### **Traffic Type:**

Traffic type is used to categorize the traffic requirements. The categorizations are useful when applying design factors and summarizing data flows. The following traffic types are utilized.

<b>Traffic Type</b>
EBnet Science
ECS Science (IP)
Expedited
Level 0
NOLAN Real-Time
NOLAN Science
PSCNI Science
Rate Buffered
Real-Time (1 Min MTTRS)
Real-Time (4 Hr MTTRS)
Store and Forward
V0 Real-Time
V0 Science

Note that distinction is made between 1 minute MTTRS real-time traffic and 4 hour MTTRS real-time traffic. Despite being real-time in nature, the 4 hour variety is often categorized with the “EBnet Science” traffic.

### **Protocol:**

Protocol is also used to categorize the traffic requirements. While not necessarily a true protocol, the assigned values are chosen to indicate the method by which the traffic requirement will be fulfilled. The categorizations are useful when applying design factors and summarizing data flows. The following protocol values are utilized.

Protocol Name
4800 Bit Block
C+D w/in 4800 Bit Block
Clock + Data
EBnet IP
EBnet TCP/IP
EBnet UDP/IP
ECS IP
MODNET-NOLAN IP
NOAA IP
Non-IP (TBD)
NSI
Physical Media
PSCNI IP
RF
Version 0 IP

### **Record:**

The record is an ID number corresponding to the database traffic record. It is useful to display this on reports because it provides a quick method of locating information in the database. This value may also be used to perform traceability to information in the EBnet Traffic Database.

### **Last Revised:**

This is the date when the requirement record was last modified.

### **Information Source:**

The information source indicates where the traffic requirement originated. A listing of information sources is provided above.



**CCR #:**

The CCR #, or Configuration Change Request, indicates the Nascom Traffic Requirement CCR number which placed (or modified) the requirement into the database.

**Start Date:**

The start date for a requirement is the date that the requirement must be fulfilled by Nascom. This usually corresponds to a Nascom implementation date.

**End Date:**

The end date for a requirement is the date that the requirement ceases to exist.

**Implementation Date:**

The implementation date for a requirement is the date that Nascom will be able to support the requirement. This usually corresponds to a start date. In some cases, the implementation date may be months or even years prior to the start date; this indicates that no new implementation is required because the infrastructure to support the requirement is already installed.

**Comments:**

Data under this heading provides additional description of the traffic requirement and is usually taken from the information source.

**Design Factors:**

Any design factors (overhead factors) applied to a traffic requirement are listed in this heading. Additional details of the design factors and traffic model are attached.

**Mutual Exclusion:**

A traffic requirement may be marked as excluded when mutual exclusion analysis identifies requirements which will not need to be satisfied simultaneously. This is typical of real-time or rate buffered traffic. Indication that the traffic requirement is marked as excluded will appear beneath the design data rate on the traffic listings.

A mutual exclusion analysis of real-time requirements was performed. This consisted of sorting the traffic requirements by spacecraft, mission phase,

data type, source and destination; for each source destination group only the record with the highest data rate was included - others were marked to be excluded.

A mutual exclusion analysis for rate buffered traffic to the ASTER-GDS and to the EOC was performed. This consisted of sorting the traffic requirements by spacecraft, mission phase, data type, source and destination; for each source destination group only the record with the lowest data rate was included - others were marked to be excluded.

## **EBnet Traffic Overhead Model**

Last Revised: 22 January 1997

### **Real-Time Forward Traffic (Destination is EDOS LZPF):**

<b>Description</b>	<b>Values</b>	<b>Factor ID</b>
= [Peak Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [EDOS/EBnet CLTU Overhead]	1.4	7

### **Real-Time Return Traffic (Source is EDOS LZPF):**

<b>Description</b>	<b>Values</b>	<b>Factor ID</b>
= [Peak Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [Path Service Overhead]	1.05	5

### **Level 0 Production Data Traffic:**

<b>Description</b>	<b>Values</b>	<b>Factor ID</b>
= [Average Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [EDOS and IP Protocol]	1.25	19
* [EDOS Contingency Factor for IP]	1.50	20

### **Store and Forward Traffic:**

<b>Description</b>	<b>Values</b>	<b>Factor ID</b>
= [Average Raw Rate]		
* [EDOS GSIF S/F Contingency Factor]	1.50	17
* [EDOS GSIF 50/45 Time Factor]	1.1111	16
* [Reed-Solomon Encoding]	1.16	24

### **Expedited Data Traffic:**

<b>Description</b>	<b>Values</b>	<b>Factor ID</b>
= [Peak Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [EDOS and IP Protocol]	1.25	19
* [EDOS Contingency Factor for IP]	1.50	20
* [N min. orbit / M min. to deliver] (1 min AM-1)	0.0082	21
(5 min AM-1)	0.0409	22
(5 min Generic)	0.0417	23

## **EBnet Traffic Overhead Model**

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### **General Science Traffic and 4 Hour MTTRS Real-Time Traffic:**

<b>Description</b>	<b>Values</b>	<b>Factor ID</b>
= [Peak Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [Scheduling Contingency Factor]	1.50	2
* [Inter-DAAC Protocol Overhead]	1.25	3

### **Rate Buffered Data Traffic:**

<b>Description</b>	<b>Values</b>	<b>Factor ID</b>
= [Average Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [EDOS and IP Protocol]	1.25	19
* [EDOS Contingency Factor for IP]	1.50	20
* [Time to Deliver Factor] (50/35 Normal)	1.4286	10
(50/1 EDOS LZPF to EOC)	50.00	18

### **Operations Management and Administrative Traffic:**

<b>Description</b>	<b>Values</b>	<b>Factor ID</b>
= [Peak Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [68/40 Overhead Factor]	1.7	12

Applies to EOC-FDF, EOC-ASTER GDS, EOC-EDOS, EOC-SMC, EDOS-SMC, and intra EDOS real-time O&M traffic (CODAs, Acq Data, CSRs, schedules, etc.).

CODA messages (EDOS to EOC); like Data Quality Monitoring; approx. 40 bytes plus 28 bytes of UDP/IP overhead. Post-pass Contact Service Report (CSR) messages (EDOS to EOC); same size as CODA messages.

## **EBnet Traffic Overhead Model**

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### **ASTER Instrument Support Toolkit (IST) Traffic:**

<b><u>Description</u></b>	<b><u>Values</u></b>	<b><u>Factor ID</u></b>
= [Average Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [EDOS and IP Protocol]	1.25	19
* [EDOS Contingency Factor for IP]	1.50	20
* [ASTER IST Scheduling Factor]	2.50	25

### **ASTER Rate Buffered, EOC Database Transfer & Command Groups, Human Computer Interface (HCI), and Level 0 Expedited Traffic:**

<b><u>Description</u></b>	<b><u>Values</u></b>	<b><u>Factor ID</u></b>
= [Average Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [EDOS and IP Protocol]	1.25	19
* [EDOS Contingency Factor for IP]	1.50	20

### **ADEOS II SeaWinds (Level 0B), DCS, and ILAS-II Traffic:**

<b><u>Description</u></b>	<b><u>Values</u></b>	<b><u>Factor ID</u></b>
= [Average Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [EDOS and IP Protocol]	1.25	19
* [EDOS Contingency Factor for IP w/out peaking]	1.20	26

### **ADEOS II GLI Traffic:**

<b><u>Description</u></b>	<b><u>Values</u></b>	<b><u>Factor ID</u></b>
= [Average Raw Rate]		
* [Circuit Utilization Factor]	1.25	1
* [EDOS and IP Protocol]	1.25	19